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Session 2C

Kentucky Water Resources Research Institute, University of Kentucky

RESULTS OF THE STATEWIDE GROUNDWATER PATHOGEN STUDY

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The Kentucky Division of Water (KDOW) conducted a statewide study of pathogens in groundwater as part of a nonpoint source assessment funded in part by the Clean Water Act Section 319(h). The goal of the study was to determine if domestic water sources in Kentucky, which are not regulated by the Safe Drinking Water Act (SDWA), are sources of safe drinking water to the segment of the population whose drinking water is not supplied by public water systems, and to inform private water owners of the condition of their water with respect to bacteria. Since the SDWA does not regulate private drinking water sources, this project was an opportunity for KDOW to evaluate whether Kentucky's private domestic water source users are being exposed to pathogens in their drinking water. It was also a chance for interested groundwater users to obtain water quality data on their well and/or spring water.

Two hundred and ten domestic water wells and springs were sampled throughout the state, with priority on those used as drinking water sources. Samples were analyzed for total coliform, *E. coli*, Iron Related, Sulfate Reducing, and Slime-Forming bacteria (using BART© kits), caffeine and the caffeine byproduct1,7-Dimethylxanthine. Although many factors can influence the presence of bacteria in water wells, in most cases it appeared to be the construction and maintenance of the water source that had the strongest influence. Further, it was anticipated that positive *E. coli* results, coupled with positive caffeine results, would indicate direct impacts to groundwater from human waste disposal activities; six wells had detections of both parameters, but the sources of each is not yet determined.

A secondary goal of this study was outreach and education to citizens that are using private groundwater sources as drinking water supplies. All participants were informed about the importance of routine water well maintenance. Copies of KDOW's Water Well Owner's Guide and generic Groundwater Protection Plans were handed out at each site. Participants also received the results of the samples collected from their wells/springs along with a letter of explanation regarding the quality of their drinking water.

NOTES

CHANGES IN NUTRIENTS AND *E. coli* DURING TWO STORM EVENTS IN HINKSTON CREEK, KY

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During storm events, rapid changes can occur in stream water nutrient loading. Hinkston Creek, KY, water quality has been analyzed for the past five years; this information was used to implement a number of best management practices (BMPs). Global warming is increasing storm intensity. More intense rainfall events (heavier rainfall over shorter periods of time) results in rapid increases in surface runoff and channel discharge; which can greatly change total pollutant loads. Accordingly, we examined short-term changes in nutrients and *E. coli* during two storm events during November and December of 2013. Water samples were taken at intervals (roughly every four hours) over the course of a few days. We took field measurements of pH, conductivity, dissolved oxygen (DO), and temperature. Water samples were brought back to the lab and immediately analyzed for *E. coli*, total suspended solids (TSS), nitrate (NO_3-N), soluble reactive phosphate (SRP), ammonia (NH_4-N), iron, sulfate (SO_4), total N (TN), and total P (TP). Sediment and sediment associated pollutants increased to a maximum just before peak discharge. These constituents remained at concentrations far above their base flow concentrations throughout the storms. Some dissolved constituents (alkalinity, and conductivity) decreased dramatically during the storms. Nitrate did not necessarily follow this trend for dissolved nutrients. During the most intense storm, nitrate concentrations increased from 700 mg m^{-3} before the storm (discharge = 400 cfs) to >3,000 mg m^{-3} at peak discharge (about 2,500 cfs). *E. coli* contamination was about

100 cfu 100 ml^{-1} at the lowest discharge (7 cfs), which increased to over 50,000 cfu 100 ml^{-1} at the beginning of the storm events. *E. coli* was consistently well over 1,000 cfu 100 ml^{-1} during the storm. A couple of large storms may contribute significantly to annual nutrient loading from Hinkston Creek. Storm-event studies are vital to determining how regional nutrient loading contributes to Gulf of Mexico anoxia. Management techniques that reduce the speed of surface run-off during storms will become more important as rainfall events increase in intensity.

ENGAGING PARTNERS IN THE CANE RUN WATERSHED

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The Cane Run Watershed (CRW) project management team, composed of the University of Kentucky, College of Agriculture, Environmental and Natural Resources Initiative, and the Department of Biosystems and Agricultural Engineering staff, is involved in an innovative, comprehensive program that engages K-12 students and teachers and citizens within the watershed and is designed to increase understanding of water quality issues and promote urban stream restoration. The two goals of the project, one for each major audience, include the following:

Goal 1: Engage K-12 and community partners in an urban watershed, the Cane Run Watershed, in an innovative education project to improve water quality in the watershed

Goal 2: Engage all citizens within the watershed in the urban-stream restoration project

The K-12 portion of the program involves the formation of partnerships between community groups and three schools to develop a geographic education tool – a map of Cane Run Environment & Watershed. The map uses a GIS platform and is accessible from a College of Agriculture, Food and Environment web site.

At last year's symposium, the leadership team presented general features of the program and reviewed progress. At the 2014 symposium, the team will present progress on both goals, including results of the 2012-13 pre-/post-test analyses, samples of student art work and updates of the map. Upcoming plans for community involvement also will be presented. Teachers and students involved in the program will be invited to the Symposium to present their findings and talk about their maps.

NOTES

THE UNIVERSITY OF KENTUCKY ENVIRONMENTAL RESEARCH AND TRAINING LAB IS AVAILABLE FOR YOUR USE

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The Environmental Research and Training Lab (ERTL) is a shared use core facility at the University of Kentucky offering a wide array of scientific instrumentation and methods to faculty, students, businesses, government organizations and non-profit organizations to generate the scientific data needed to achieve their research goals. We provide access to state of the art analytical equipment and customized project specific training in organic chemistry, inorganic chemistry, microbiology, and molecular biology methods.

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